

P R O J E C T facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

ADVANCED power
S Y S T E M S

DB RILEY—LOW EMISSION BOILER SYSTEM (LEBS): SUPERIOR POWER FOR THE 21ST CENTURY

PRIMARY PROJECT PARTNER

DB Riley, Inc.
Worcester, MA

MAIN SITE

Worcester, MA

TOTAL ESTIMATED COST

\$116,000,000

COST SHARING

DOE	\$42,500,000
Non-DOE	\$73,500,000

Project Description

In conjunction with the U.S. Department of Energy, DB Riley, Inc., is developing a highly advanced coal-fired power-generation plant called the Low Emission Boiler System (LEBS). By the year 2000, LEBS will provide the U.S. electric power industry with a reliable, efficient, cost-effective, environmentally superior alternative to current technologies.

LEBS incorporates significant advances in coal combustion, supercritical steam boiler design, environmental control, and materials development. It employs the combustion expertise of Deutsche-Babcock, the University of Utah, and Reaction Engineering International; the pollution-control experience of Thermo Power Corporation; and the plant design practices of Sargent & Lundy Engineers.

The system will include a state-of-the-art steam cycle operating at supercritical steam conditions; a slagging combustor that produces vitrified ash by-products; low nitrogen oxide (NOx) burners; a new, dry, regenerable flue gas cleanup system (copper oxide process) for simultaneously capturing sulfur dioxide (SO₂) and nitrogen oxides (NOx); a pulse-jet fabric filter for particulate capture; and a low-temperature heat-recovery system.

The copper oxide flue gas cleanup system, which has been under development at DOE's Pittsburgh field center, removes over 98% of SO₂ and 95% of NOx from flue gas. A new moving-bed design provides efficient sorbent utilization that lowers the cleanup process cost. The captured SO₂ can be converted to valuable by-products such as sulfuric acid and/or elemental sulfur, and the process generates no waste.

Program Goal

DOE's strategic plan aims not only to ensure a reliable and affordable energy supply for the U.S., but also to minimize adverse environmental impact. The highly advanced coal-fired LEBS will achieve significantly lower emissions and higher plant efficiencies than conventional units. Performance objectives of LEBS include plant thermal efficiencies of 42%; lower emission levels of SO₂, NOx, and particulates; and a cost of electricity equal to or less than that of conventional coal-fired power plants.

Project Partners

SARGENT & LUNDY ENGINEERS
Chicago, IL
(plant design)

THERMO POWER CORPORATION
Waltham, MA
(pollution control)

UNIVERSITY OF UTAH
Salt Lake City, UT
(combustion)

REACTION ENGINEERING INTERNATIONAL
Salt Lake City, UT
(combustion)

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CONTACT POINTS

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Project Benefits

In the near future, the United States will have to build a new generation of coal-based power plants to replace its aging units. Coal supplies more than 56% of the nation's electricity, and, because of our abundant reserves, it will remain the dominant source of fuel for power generation well into the next century. A national cap on sulfur and nitrogen oxide (NOx) emissions, however, will require future coal technologies to be much cleaner than current technology.

DOE is sponsoring the Low Emission Boiler System Program to meet these power and environmental needs. Without significantly departing from the traditional design features of pulverized coal-firing systems, this technology will:

- Reduce sulfur dioxide and NOx emissions to a sixth of the levels allowed by today's Federal air quality standards (New Source Performance Standards).
- Lower emissions of flyash and other particulates to a third of those allowed by today's standards.
- Significantly improve power-plant efficiency—from today's level of 35% up to 48%.
- Produce electricity at costs equal to or less than those of a modern-day coal plant.

LEBS is one of several advanced power generation systems that are being developed with support from DOE. Of these systems, LEBS offers the nearest-term commercial option for utilities to meet these performance goals for new installations. In addition, many of the technologies that are being developed in the LEBS Program will be available for retrofit or repowering applications at existing facilities.

DB Riley, along with ABB-Combustion Engineering and Babcock & Wilcox, are leading independent teams to develop low emission boiler systems that incorporate each team's unique, preferred technologies. In mid-1997, one of the teams will be selected to construct and operate a proof-of concept (POC) test facility to provide the engineering data for commercializing its system by the year 2000.

Cost Profile (Dollars in Millions)

	Prior Investment	FY95	FY96	FY97	Future Funds**
Department of Energy *	\$5.9	\$2.1	\$2.0	\$8.5	\$24.0
Private Sector Partners	\$1.1	\$0.8	\$0.7	\$6.9	\$64.0

* Appropriated Funding

** If DB Riley is selected to design, construct, and operate a proof-of-concept power plant, a total of about \$100 million (\$30 million DOE) will be required with \$6 million needed in FY97.

Key Milestones

FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00
Planning and Development				Design and Testing		Design	Construction and Operation		
Concept development Preliminary R&D Component testing Commercial generating unit: preliminary design				Subsystem testing Proof-of-concept facility: preliminary design Selection of host site for POC facility		POC facility: revised design Commercial generating unit: revised design	Construction and operation of POC facility		